DOCUMENT RESUME

ED 238 404 IR 010 926

AUTHOR Reisner, Elizabeth R.
TITLE The Use of Computers in Instruction Supported under Chapter 1 of the Education Consolidation and Improvement Act.
INSTITUTION Policy Studies Associates, Inc., Washington, DC.
SPONS AGENCY Department of Education, Washington, D.C. Office of Planning, Budget, and Evaluation.
PUB DATE Sep 83
CONTRACT 300-82-0375
NOTE 25p.
PUB TYPE Information Analyses (070)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Access to Education; Case Studies; *Compensatory Education; Computer Assisted Instruction; Computer Oriented Programs; Computers; *Disadvantaged Youth; Elementary Secondary Education; Federal Programs; Government Role; *Microcomputers; *Program Effectiveness; School Surveys; Teaching Methods; *Use Studies
IDENTIFIERS Computer Uses in Education; *Education Consolidation Improvement Act Chapter 1; Technical Assistance Centers

ABSTRACT

Based on the results of informal surveys conducted by each of four Technical Assistance Centers and several surveys and studies addressing the availability and use of computers and microcomputers in education, this paper examines the accessibility of computer technology to disadvantaged students in Chapter 1-assisted instructional programs. A review of the extent of computer use covers the provision of Chapter 1-assisted instruction, computer access, and numbers of computers available in Chapter 1 and other schools having at least one computer, computer use by Chapter 1 students, factors influencing computer availability in Chapter 1 projects, and prospects for future computer access by Chapter 1 students. Discussion of the types of computer-related instruction used in Chapter 1 projects includes differences in computer use between white and non-white low-income schools and organizational arrangements. In an examination of the effectiveness of computer-related Chapter 1 instruction, studies reviewed include an experimental study of computer assisted instruction in mathematics, reading, and language arts for low-achieving students; a case study of Houston's instructional computing program serving disadvantaged students; and case studies of computer technology implementation in three school systems. Approaches for improving computer-related instruction in Chapter 1 projects are suggested, implications for federal responsibilities are examined, and nine references are listed. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IR

POLICY STUDIES ASSOCIATES, INC.

ELIZABETH R. REISNER
BRENDA J. TURNBULL

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
■ This document has been reproduced as received from the person or organization originating it.
□ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

1503 TWENTY-FIRST STREET, N. W.
WASHINGTON, D. C. 20036
(202) 296-4460

ED238404

THE USE OF COMPUTERS IN INSTRUCTION SUPPORTED UNDER CHAPTER 1 OF THE EDUCATION CONSOLIDATION AND IMPROVEMENT ACT

Elizabeth R. Reisner

September 1983

Prepared for the U.S. Department of Education
Office of Planning, Budget and Evaluation

Prepared under Contract No. 300-82-0375
with Advanced Technology, Inc.

IR010926

THE USE OF COMPUTERS IN INSTRUCTION SUPPORTED UNDER CHAPTER 1 OF THE EDUCATION CONSOLIDATION AND IMPROVEMENT ACT

The availabililty of low-cost microcomputers has permitted increased use of computer technology in the provision of instruction in elementary and secondary schools. Students disadvantaged by poverty and by poor educational achievement may, however, have less access to these new learning tools than other students. In addition, their exposure to computers may involve different and perhaps less beneficial instruction than that provided to other students. The existence of either of these problems raises important federal questions regarding, first, whether differences in computer use are likely to be harmful to disadvantaged children and, second, what steps should be taken at the federal level to address these conditions.

The main vehicle available at the federal level for addressing inequities in the instructional opportunities provided to disadvantaged students is the program of educational assistance authorized by Chapter 1 of the Education Consolidation and Improvement Act (ECIA). This paper reviews information regarding the access of disadvantaged students to computer technology under Chapter 1-assisted programs of instruction. This topic is approached here through an examination of several questions regarding the availability and use of computers[1/] in Chapter 1 programs. The questions are as follows:

1. To what extent are computers used in the provision of instruction supported under Chapter 1? Are Chapter 1-participating students more or less likely than other students to use computers in school?

2. What are the instructional activities for which computers are used under Chapter 1? How do these activities differ from computer-related instruction offered to other students?

1/ In this paper, "computers" refer both to microcomputers and to computer terminals connected to a central processor. This definition is adapted from that used by the National Center for Education Statistics (NCES) in its 1982 survey report, "Instructional Use of Computers in Public Schools." Because several studies reviewed here were concerned only with microcomputers, parts of the discussion in this paper refer to microcomputers only.

3. Does computer use increase the effectiveness of instruction provided to Chapter 1 students? What factors are likely to increase the effectiveness of computer-related instruction provided to Chapter 1 participants?

These questions are made particularly important by recent anecdotal reports suggesting that rapid growth occurred in school year 1982-83 in the acquisition of computer hardware and software by Chapter 1 programs.

A number of information sources have been used in assembling the data and conducting the analyses presented in this paper. One useful resource has been the results of informal surveys conducted by each of the four Technical Assistance Centers (TACs).[2/] Each TAC was asked to determine for the states of its region (1) the access of Chapter 1 students to computers, particularly in comparison with other students; (2) whether Chapter 1 students are more likely to use computers for instruction involving drill and practice than are other students; (3) factors affecting computer acquisition under Chapter 1; and (4) factors affecting computer acquisition by school systems generally. Each TAC assembled information from its states on these questions and submitted the information to the TAC project officer in the U.S. Department of Education. Most of the submissions reported broadly on trends within the regions and did not identify states by name as having particular policies or activities under way.

In addition to the TAC reports, other resources used in this paper include several surveys and studies addressing particular topics in the availability and use of computers in education. The results of four surveys have been particularly valuable in this regard. These surveys are described here briefly in the order in which they are mentioned in the paper.

1. In September 1982, NCES released results of its Fast Response Survey on the availability and instructional uses of computers in public schools (NCES, 1982). The survey collected data from a national probability sample of 900 public elementary and secondary schools in April 1982. The NCES sample specifically

---

[2/] Supported under contracts with the U.S. Department of Education, the TACs provide technical assistance, including training, to state education agencies (SEAs) and others in the evaluation of local instructional programs assisted under Chapter 1.

identified schools receiving services under Title I of the Elementary and Secondary Education Act.

2. Data from a report issued by Market Data Retrieval (MDR, no date) have also been used in this paper. The MDR report was intended to assist computer vendors in ascertaining the school market for microcomputers. The report presents analyses of MDR's data on all U.S. elementary and secondary schools in order to identify the characteristics of schools that have one or more microcomputers. Schools qualifying for Title I services are identified in the MDR data.

3. In early 1983, Henry Jay Becker of the Center for Social Organization of Schools, Johns Hopkins University, released the results of his survey on the availability and uses of microcomputers in schools. The survey results are presented in two issues of a newsletter, entitled School Uses of Microcomputers (Becker, 1983a, 1983b). The survey collected data from a national probability sample of 2,209 public and private elementary and secondary schools in December 1982. Schools with high proportions of low-income students are identified in Becker's sample.

4. In May 1983, results were made available from a survey conducted by Robert F. Cheuvront of the Colorado Department of Education. The report presented the tabulated responses to a questionnaire sent on January 1983 to each state director of ECIA Chapter 1, requesting information on the use of computers in Chapter 1 programs within their respective states.

Extent of Computer Use in the Provision of Chapter 1-Assisted Instruction

The available evidence suggests that computers play a relatively small but growing role in the provision of Chapter 1 instruction. In general, Chapter 1 students appear to have about the same access to computers as other students during the school day. To elaborate on these conclusions, this broad topic has been divided into several parts. The first section of the following discussion addresses the availability of computers in schools designated to receive Chapter 1 services. The second section discusses the number of computers in Chapter 1 schools that have at least one computer. The third section addresses the access to computers by Chapter 1 students

themselves. The fourth and fifth sections discuss factors influencing the availability of computers in Chapter 1 projects and prospects for future Chapter 1 use of computers, respectively.

Access to Computers in Chapter 1 and Other Schools

Two school-level surveys have generated annalyses of computer access in Chapter 1 and other schools, the 1982 NCES Fast Response Survey on instructional uses of computers and the MDR survey (no date) on the school market for microcomputers.

The NCES data suggest that Chapter 1 schools are about as likely to have a computer as are other schools. According to unpublished analyses of the NCES survey results, about 35 percent of all Title I schools had at least one computer in school year 1981-82. By comparison, one or more computers were present in about 36 percent of all schools not providing any Title I services. (Title I of the Elementary and Secondary Education Act was the predecessor of ECIA Chapter 1 and was in effect in school year 1981-82.)

In apparent contrast, the MDR data indicate that schools in school systems with high proportions of students from low-income families were less likely at the time of their survey to have one or more microcomputers than were schools in school systems enrolling students from more affluent families. These findings are summarized in Table 1. MDR's findings in this regard were

Table 1

Percent of Public Schools with Microcomputers in School Systems with Varying Levels of Poverty

Percent of Low-Income Students in School System	Number of Schools	Percent of Schools with 1 or More Microcomputers
0.0 - 4.9 %	12,112	30%
5.0 - 11.9	26,220	21
12.0 - 24.9	28,377	17
25.0 +	14,072	12

Source: MDR (no date).

confirmed in Becker's analysis (1983a) of survey data from a nationally representative sample of schools.

MDR also found that schools with high per pupil expenditures for instructional materials were more likely to have at least one microcomputer than were other schools, as shown in Table 2. MDR included federal, state, and local sources of funding in its calculations of per pupil spending for instructional materials but stated that local sources were the "most significant source of funding" for instructional materials.

Table 2

Percent of Public Schools with Microcomputers, Analyzed by Per Pupil Expenditure for Instructional Materials

Per Pupil Expenditure for Instructional Materials	Number of Schools	Percent of Schools with 1 or More Microcomputers
$60 +	28,115	25%
30 - 59.99	49,022	17
0 - 29.99	4,635	12

Source: MDR (no date).

When considered together, the NCES and MDR findings suggest that Chapter 1 may be a major source of funds for the acquisition of computers in school systems with large proportions of low-income students. The MDR data indicate that schools in school systems with the largest proportions of low-income (and thus Chapter 1-eligible) students may be least likely to have a microcomputer, when compared to schools in school systems with fewer low-income students. On the other hand, individual schools receiving Chapter 1 services are, according to NCES, quite likely to have a computer (i.e., Title I schools were about as likely to have a computer as were other schools, according to NCES). These two findings suggest, first, that, within school systems having large proportions of low-income children, Chapter 1 schools are probably more likely to have a computer than are other schools. Second, because we cannot otherwise account for the greater relative prevalence of computers in Chapter 1 schools in these districts, Chapter 1 funds were probably used to acquire the computers.

Data from the TAC reports suggest that this second conclusion is probably accurate; these data do not address the first conclusion, however.

Numbers of Computers Available in Chapter 1 and Other Schools Having at Least One Computer

Published analyses of NCES 1982 data indicate slightly more computers available in each non-Title I school having at least one computer, as compared to Title I schools having at least one computer. The average number of computer units (i.e., computer terminals or microcomputers) in these non-Title I schools was 4.7 in school year 1981-82, while in Title I schools with computers there was an average of 3.7 units per school. The discrepancy in these numbers may be the result of the fact that Title I (and now Chapter 1) schools were more likely to be elementary schools than were non-Title I schools. (According to data provided by NCES, approximately 66 percent of all Chapter 1 schools are elementary schools, while only 57 percent of all non-Chapter 1 schools are elementary schools.) Because elementary schools generally have lower enrollments than secondary schools, they would be expected to have somewhat fewer computers per school.

The NCES analyses also indicate that computers in non-Title I schools were more heavily used than computers in Title I schools (although neither Title I nor non-Title I schools used any of their computers for as much as one-half of the school day on average). Each computer in a non-Title I school was used an average of 392.4 hours in school year 1981-82, while each computer in a Title I school was used an average of 331.8 hours (or less than two hours per school day). According to the NCES analysis, this difference reflects the fact that fewer students used each computer in Title I schools as compared to non-Title I schools; in each Title I school an average of 35.7 students used the computer in school year 1981-82, while in each non-Title I school the computer was used by an average of 42.6 students. Again, the smaller enrollments typical of most elementary schools could explain this difference. On average, students used a computer for about the same amount of time in the two categories of schools, with Title I students who used a computer having about 9.3 hours of use in school year 1981-82 and non-Title I students who used a computer having about 9.2 hours of use.

While the relative sizes of elementary and secondary schools provide one plausible explanation, the difference in number of students using computers in Title I and non-Title I schools may also reflect local efforts to limit the use of Title I-acquired equipment to Title I-participating students only. This interpretation is based on an assumption that large numbers of the computers in Title I (and now Chapter 1) schools were acquired with Title I and Chapter 1 funds. If so, the prohibition in Chapter 1 against use of Chapter 1 funds for general educational aid would limit computer access within schools to students actually receiving Chapter 1 services. (Under Chapter 1 targeting requirements, Chapter 1 participants are generally the lowest achieving students within the grades in which a school's Chapter 1 project operates.) Anecdotal reports suggest that the prohibition on general aid is a concern for Chapter 1 program administrators considering the purchase of computers. No survey data are available, however, to confirm this interpretation of why low numbers of students use computers in Chapter 1 schools.

Still another explanation for the lower use of computers in Chapter 1 schools is that elementary schools tend to use their computers less intensively, measured according to amount of weekly use, than do secondary schools. In Becker's survey (1983b), elementary schools with one or more microcomputers were found to use each microcomputer for 11 hours per week. In contrast, secondary schools with one or more microcomputers used each of them for about 13 hours per week.

Use of Computers by Chapter 1 Students

According to information collected by the four TACs, Chapter 1 students generally have about the same access to computers in schools as other students. While these data reflect in most cases the opinions of state Chapter 1 coordinators, their views were in some cases informed by state surveys of computer use and other state-wide data. The finding in the TAC reports of generally equal computer access for Chapter 1 students is fairly consistent across all four TAC regions. Although several state Chapter 1 coordinators said that they did not know whether Chapter 1 students had equal computer access in their state, only three states reported less access to computers by Chapter 1 students, as compared to other students. One of these state coordinators

said that Chapter 1 students currently had less computer access than other students but that the access of Chapter 1 students was "rapidly gaining." A second state coordinator said that Chapter 1 students had less access than other students because the state's large urban districts had not been able to acquire computers, thus denying computer access to a large proportion of the state's Chapter 1 population. The third state coordinator provided no explanation for why Chapter 1 students in his state had less access to computers than other students.

Decisions regarding which students in a school can use the school's computers are affected by the instructional uses intended for the computers, according to anecdotal reports. For example, Chapter 1 students are more likely to use the computer if it is primarily intended to provide remedial instruction. They are less likely to use the computer if it is intended for enrichment purposes.

Factors Influencing the Availability of Computers in Chapter 1 Projects

Decisions by local Chapter 1 projects to acquire computer hardware and software appear to be influenced by three factors. First, Chapter 1 projects are more likely to acquire computer equipment and materials if there is at least one teacher who has a particular interest in the computer as an educational tool. Called "computerists" by Becker (1983b) and "computer buffs" by Sheingold, Kane, Endreweit, and Billings (1981), these individuals appear to be particularly instrumental in stimulating interest among other teachers in using computers in instruction. When a teacher "computerist" is part of the Chapter 1 project, the focus of instructional activities stimulated by him or her is likely to be on improving instructional services for disadvantaged children.

The second factor influencing local availability of computers in Chapter 1 is the existence of a state policy that is focused on acquisition and use of computers either in Chapter 1 or in all instructional areas. According to the survey of SEAs conducted by Cheuvront (1983), ten states currently have policies for computer acquisition and use in Chapter 1. In general, these policies are intended to encourage careful planning for the purchase (or lease) and use of computers at the local level. Depending on the characteristics of the state

review of requests to acquire computers, the planning requirements may either encourage or discourage local initiatives in this area. According to the survey respondents, only one state officially encourages the expanded use of computers in instruction.

The third factor affecting Chapter 1 computer availability is local reaction to the Chapter 1 requirements prohibiting use of Chapter 1 funds for general aid. As noted previously, the general aid prohibition requires that Chapter 1-purchased equipment and materials be used in Chapter 1 schools to benefit Chapter 1 students only. According to anecdotal reports, some school systems have been concerned that computers purchased with Chapter 1 funds would be under-used because the general aid prohibition would preclude their use by non-Chapter 1 students. (According to the NCES data reviewed earlier, computers in Title I schools were used somewhat less than computers in other schools.) Although the problem of under-use can be avoided by combining Chapter 1 funds and other funds in purchasing computer hardware and software (and then allocating a pro-rated share of computer access to non-Chapter 1 students), some local systems have nevertheless decided not to use Chapter 1 funds for computers because of their concern for maintaining compliance with the general aid prohibition.

Prospects for Future Access to Computers by Chapter 1 Students

In Cheuvront's survey, state-level respondents were asked about the level of computer use by local Chapter 1 projects in their states. As shown in Table 3, the majority of the 51 respondents reported rapid increases in computer use.

According to the TAC reports, state-level Chapter 1 coordinators generally expect computer use to increase in local Chapter 1 projects. The state respondents gave varying reasons for this expectation, with the most frequent being the general increase in local interest in computer use and the assumption that Chapter 1 projects would share in this increase in the acquisition and use of computers for educational purposes. In addition, with the decline in price of computer hardware, the purchase of one or more microcomputers is becoming more feasible under local Chapter 1 budgets for instructional materials.

Table 3

Extent of Computer Use by Local Chapter 1 Projects, as Reported by SEAs

Extent of Use	Number of SEAS[a/]
Rapid increase in use	28
Broad use	6
Some use; no particular emphasis	16
Little or no use	2

a/ It is not clear why the total exceeds the number of SEA respondents, but presumably "rapid increase" and other categories are not mutually exclusive.

Source: Cheuvront (1983).

Several state respondents also mentioned that local use of ECIA Chapter 2 funds for purchase of instructional hardware and software has stimulated interest in the use of Chapter 1 funds for the same purpose. This interest seems to reflect a "bandwagon" sort of momentum. Chapter 1 students may use any equipment or materials acquired with Chapter 2 funds, so there is no actual need to make any parallel expenditures under Chapter 1.

Despite possible future gains in computer access by Chapter 1 students, however, a major question affecting the use of computers in educational programs will be the access of disadvantaged students to computers outside of school, especially in the home. Although empirical data on this issue are not available, it seems certain that disadvantaged students are far less likely to have computers in their homes than are other students. It is hard to know for certain how this difference in home access will affect the relative skills and technological know-how of the two groups, but the disadvantaged students will almost certainly be the losers. Whether school experiences with computers can make up this difference will be a question requiring careful consideration.

Types of Instruction Provided Using Computers in Chapter 1 Projects

Many factors affect local decisions about how computers will be used in instruction. One such factor is the limited amount of computer time available to most student users. Becker (1983b) found in his survey that the average computer user in elementary school received less than 30 minutes of computer time per week; secondary school users had about twice that amount of time. Table 4 presents information on the proportion of users at elementary and secondary levels who used computers for varying amounts of time per week. These data are consistent with information provided by NCES, showing that elementary students in computer-owning schools are more likely to use a computer than are secondary students in computer-owning schools; elementary students are, however, likely to use the computer for less time per student, as compared to secondary students.

Table 4

Amount of Computer Time Per Week for the Average Computer User at Elementary and Secondary Levels

Amount of Time Per Week	Percent of Elementary School Users	Percent of Secondary School Users
0-15 minutes	32%	23%
16-30 minutes	46	12
31-60 minutes	19	27
61+ minutes	3	38

Source: Becker (1983b).

According to the NCES (1982) data cited earlier, Title I and non-Title I students had about the same amount of computer time over the school year in school year 1981-82 (i.e., 9.3 hours and 9.2 hours respectively). On that basis, it is reasonable to expect that the amounts of computer time shown in Table 4 are likely to be fairly accurate estimates for Chapter 1 students. Because Chapter 1 students are more likely to be elementary than secondary school students, the data for elementary school users are likely to be more reflective of Chapter 1 computer use.

Instructional Activities in Which Computers Are Used In Chapter 1 Projects

A consideration of the short amount of computer time available to Chapter 1 students (and other students) is important because the amount of computer time available constrains the instructional alternatives from which Chapter 1 teachers and administrators can choose. NCES data indicate that Title I students (and other students) spent about as much time learning about the computer as learning with the computer in school year 1981-82. Indeed, while this choice of priorities may be educationally appropriate, instructional decisions to teach students about what the computer can do and how to use it may often be driven by the lack of time to use the computer more extensively.

Unpublished NCES analyses indicate the major uses of microcomputers in Title I and non-Title I schools that are shown in Table 5. In this table,

Table 5

Percent of Schools with Microcomputers Indicating Major Allocations of Microcomputer Time

Activity Receiving Major Allocation of Time	% of Title I Schools[a/]	% of Non-Title I Schools
Compensatory/remedial (for students below grade level)	19%	9%
Basic academic skills (e.g., arithmetic, language arts; for students at or above grade level)	20	18
Learning enrichment	17	21
Computer literacy (introduction to computer concepts)	25	40
Computer science	16	31

a/ Columns do not total 100 because some schools indicated more (or fewer) than one major allocation of microcomputer time.

Source: Unpublished analyses of NCES data (1982).

the first two activities (i.e., "compensatory/remedial" and "basic academic skills") may be considered to be activities for learning with the computer,

while the final two (i.e., "computer literacy" and "computer science") are activities for learning about the computer. "Learning enrichment" usually contains elements of both categories.

In both Title I and non-Title I schools, major allocations of time were more likely to be given to instruction in computer literacy than to any other area, as seen in Table 5. Non-Title I schools were, however, more likely to devote major allocations of time to computer literacy than were Title I schools. By contrast, Title I schools were more likely to devote major time allocations to compensatory and remedial activities and were less likely to provide significant amounts of instruction in computer science and computer literacy. As discussed earlier, some of these differences between Title I and non-Title I schools may be a partial reflection of differences between elementary and secondary schools. Indeed, analyses presented by NCES indicated similar patterns of microcomputer use for Title I schools and for all elementary schools, except that Title I schools showed slightly higher tendencies to use microcomputers for compensatory/remedial activities and for computer science and lower tendencies to use microcomputers for other activities.

The frequency with which computers are used for remedial instruction is confirmed by the reports of the Chapter 1 TACs. Most of the state Chapter 1 coordinators said that local Chapter 1 projects tend to use computers for drill and practice activities to a greater extent than do the regular instructional programs of their respective school systems. Although not explicitly indicated in the TAC reports, this instructional use of computers is not surprising because drill and practice activities can be designed to reinforce instruction in the basic skills on which Chapter 1 projects generally focus. If the basic academic skills of Chapter 1 students are, in fact, being improved through drill and practice with the computer, then the choice of this instructional activity is reasonable.

Differences in Computer Use Between White and Non-White Low-Income Schools

The results of Becker's survey (1983a, 1983b) permit an examination of certain differences among schools in the use of microcomputers for drill and practice activities and for instruction in computer programming. In unpublished analyses of microcomputer use in low-income schools, Becker found

significant differences in microcomputer use by low-income elementary schools of varying racial compositions. Although data on which these analyses are based do not permit identification of Chapter 1 and non-Chapter 1 schools, they do permit identification of schools in which students from low-income families predominate, and among these schools the data permit differentiation between those schools in which a majority of the students are white or non-white. Analyses of microcomputer use in elementary schools indicate significantly more instruction in computer programming in low-income, majority white schools. These elementary schools are, in fact, twice as likely to teach programming as are elementary schools in general. By contrast, low-income schools where the majority of students are non-white are far more likely to use computers for drill and practice and to teach little or no computer programming.

These differences in computer use among low-income schools are surprising in many respects. They are partially explained by the fact that there are fewer "computerists," as Becker terms them, in low-income schools that are majority non-white, as compared to low-income schools with majority white enrollments. Because "computerist" teachers tend to experiment with varying uses of computers in instruction and to encourage computer innovation within their schools, they are less likely to use computers for more routine activities, such as drill and practice. Although the lack of "computerists" in low-income, majority non-white schools may help explain why these schools do not teach programming, we are left with the question of why there are fewer "computerists" in these schools in the first place.

Organizational Arrangements Used in the Provision of Computer-Related Instruction Under Chapter 1

Although not widely explored in the surveys and studies conducted to date, an important decision made by school systems that use computers in their Chapter 1 projects concerns the organizational arrangements used for providing computer-related instruction. Are Chapter 1 students pulled out of regular classes to receive Chapter 1-funded services? Do the Chapter 1 students stay in their regular classes and receive supplementary instruction not provided to their non-Chapter 1 classmates? Or are Chapter 1 students grouped together

in Chapter 1-only classes, where they receive special instruction? Instruction using computers can be provided to Chapter 1 students using any of these three basic approaches.

Varying advantages and problems undoubtedly characterize each approach. In Sheingold et al. (1981), the task of integrating computer-related instruction into the regular curriculum was highlighted as a major problem observed in the three case study districts. It is reasonable to expect that this problem would be even greater in Chapter 1 projects, where Chapter 1 compensatory services are supplementary to the regular curriculum. The instruction provided with computers in Chapter 1 projects must be integrated into the overall compensatory curriculum supported under Chapter 1, which must then be integrated into the regular academic program of the school. In future research on instructional applications of computers, it will be useful to investigate the instructional settings in which computers are most likely to be well integrated into the overall curriculum.

Effectiveness of Computer-Related Instruction in Chapter 1 Projects

Questions regarding the use of computers in Chapter 1 projects are important only if computer-related instruction can be shown to be a desirable feature of an overall instructional program. If computer-related instruction leads to improvement in the achievement of Chapter 1 students, then it naturally becomes important to extend opportunities for such instruction to greater numbers of Chapter 1 students. In addition, if computer-related instruction helps Chapter 1 students learn about the uses of new technologies (aside from any improvement in their basic skills), the opportunities for such instruction are valuable.

No systematic information exists on the effectiveness of computer-related instruction in Chapter 1 projects. Becker (1982a), however, presents data indicating that teachers who use computers in instruction believe that "above-average" students learn more from using computers than do "average" or "below-average" students. In his survey, 24 percent of the computer-using teachers said that access to a microcomputer had resulted in "'much more academic learning by above-average students.'" In comparison, only six percent of the teachers said

that the same was true for "average" students, and seven percent said that this was true for "below-average" students. This finding is not surprising because "above-average students," almost by definition, derive greater academic benefit from virtually any kind of learning activity, as compared to other students. Because Chapter 1 participants are generally the lowest-achieving students within their grade in Chapter 1 schools, they would tend to be included among the "below-average" students.

Although studies have not been done to test the effectiveness of computer-related instruction in Chapter 1 projects, several studies have been completed that contain information and findings relevant to Chapter 1. Three that are particularly pertinent are discussed here briefly. Because none of these studies addresses instructional effectiveness in terms of learning about new technologies, these discussions are confined to the effects of computer-related instruction on student achievement.

Experimental Study of Computer-Assisted Instruction (CAI) in Mathematics, Reading, and Language Arts for Low-Achieving Students

In a recent study, compensatory education students in several Los Angeles elementary schools were randomly assigned to supplementary CAI programs in mathematics, reading, and/or language arts (Ragosta, 1983). Participating students received 10 to 20 minutes of CAI daily throughout the school year, according to a rigorous experimental design. They participated in the program for one-, two-, or three-year periods and were tested in the fall and spring of each year of participation. The curricula used were developed by Computer Curriculum Corporation of Palo Alto, California, and focused on drill and practice in basic skills.

The largest achievement effects on participating students were found in mathematics, with the greatest gains seen for students who received supplementary mathematics instruction for the full three-year period. Positive but smaller effects were seen with the reading and language arts curricula, where student gains were not higher for students who participated in the CAI project longer than one year.

According to Ragosta, the success of CAI in this study may have been due, in part, to the careful implementation of the project. Highly qualified

teachers supervised all student activities, with students provided regular access to the curricula (and computers) over the entire school year. As described by Ragosta, the CAI curricula themselves were based on the principles of mastery learning (Bloom, 1974) and direct instruction (McDonald and Elias, 1976). Although highly encouraging with respect to the achievement possibilities of CAI, the findings of this study may not be applicable to CAI programs implemented under less promising circumstances.

Case Study of Houston's Instructional Computing Program Serving Disadvantaged Students

A recent report of the congressional Office of Technology Assessment (1982) includes a case study of CAI programs in the Houston Independent School District. Houston was selected for special review in the report because of the district's long involvement with computer-related instruction and its experience in providing such instruction to disadvantaged students. Local evaluations of CAI in the Houston Title I program showed achievement gains for participants, although the gain scores presented in the case study are not significantly higher than those generally expected of compensatory students when tested on a fall-to-spring basis. Other conclusions regarding achievement gains came from teachers of participating students:

> Of teachers whose [Title I] students participated in the CAI labs, 93 percent felt that student performance improved as a result of CAI and 63 percent reported that students' achievement was greater than would be expected in a traditional instructional program. While students looked forward to CAI classes, teachers complained about the disruption to their classes when students were pulled out. Scheduling was fixed and inflexible. Moreover, when computers were down or telephone lines malfunctioned, students missed instruction.

Houston administrators claimed in the case study to be highly optimistic about the expanded use of computers in all aspects of their instructional program (including, for example, the preparation of individualized guides for parents willing to help their children improve their basic skills). Their priorities over the next several years are reported in the case study to

include improvements in the quality of instructional software and in planning for the use of software and hardware.

Case Studies of the Implementation of Computer Technology in Three School Systems

The study by Sheingold et al. (1981) did not specifically address the provision of computer-based instruction to disadvantaged students. Nevertheless, the study's findings are generally relevant to Chapter 1 projects in several respects. Overall, the study found that the value of computers in instruction was closely linked to the integration of the computer-based instruction into the regular academic program of the school. In particular, this integration seemed to depend on the quality and appropriateness of the instructional software being used. A second essential element in the success of computer-based instruction was the familarity of the participating teachers with the instructional software and with possible approaches for fitting the software into students' regular academic curriculum.

The conclusions of their study are highly relevant to Chapter 1 projects:

> The microcomputer innovation is being fueled by a great deal of enthusiasm. The conviction is that the microcomputer is a good thing. Yet no one knows for sure if it is good, how it is good, or what it is good for, in terms of educational outcomes. We need to acquire such knowledge quickly, in order to help guide an innovation which is growing in the absence of research guidance. What our study suggests, however, is that microcomputers per se will not promote particular outcomes. Their impact will depend, not only on hardware and software, but on how they are used and on the educational context within which they are embedded.

Approaches for Improving the Effectiveness of Computer-Related Instruction Provided in Chapter 1 Projects

Information from several sources indicates the needs experienced by local Chapter 1 projects in providing instruction using computers. Some of the most relevant of these data come from unpublished analyses of the 1982 NCES survey. Table 6 presents information showing major computer-related needs in Title I

schools, as contrasted with non-Title I schools. Needs for more microcomputers and for suitable courseware were indicated as major needs by the greatest percent of Title I schools. Given what we know about the small number of computers in the average computer-owning Title I school, it is not surprising that more hardware and better software are needed. Even higher proportions of non-Title I schools indicated major needs in the same areas, however. In fact, non-Title I schools exceeded Title I schools by a wider margin (i.e., eight percentage points) in their need for more microcomputers than in any other need. Only in the need for staff/community support did Title I schools slightly exceed non-Title I schools.

Table 6

Percent of Schools Indicating Major Needs Related to Initiation or Improvement of Computer-Based Education

Need	Percent of Title I Schools[a/]	Percent of Non-Title I Schools
Start-up assistance	47%	51%
Qualified teachers	48	53
More microcomputers	60	68
Suitable courseware	60	64
Staff/community support	42	40

[a/] Columns total more than 100 because some respondents indicated major needs in more than one area.

Source: Unpublished analyses of NCES survey data (1982).

A second source of information on local computer-related needs in Chapter 1 projects is Cheuvront (1983). Table 7 presents information on technical assistance activities reported by SEA respondents to be needed. Survey respondents were asked to weigh local needs related to computer-based instruction, as they perceived them, against overall needs for technical assistance in administering Chapter 1 projects. As seen in the table, almost two-thirds of the survey respondents gave some priority, but not highest priority, to technical assistance for improving computer-based instruction.

Table 7

Priority Assigned by SEAs to Technical Assistance for Improving Computer-Based Instruction in Chapter 1

Priority Assigned	Percent of SEAs Responding[a/]
Highest priority: provide special technical assistance to districts during upcoming school year	28%
Some priority: include in general technical assistance programs	64
Low priority: provide technical assistance upon request	9

a/ Column does not total 100 due to rounding.

Source: Cheuvront (1983).

This survey also asked what types of technical assistance activities would be most useful to local Chapter 1 projects. As seen in Table 8, technical

Table 8

Types of Technical Assistance Likely to Be Useful, According to SEAs

Types of Technical Assistance	Percent of SEAs[a/]
A conference sponsored by ED	47%
An SEA-sponsored conference and/or regional technical assistance meetings	71
A network for disseminating information on effective practices	53
Consultant services	67

a/ Total exceeds 100 because respondents could indicate more than one activity.

Source: Cheuvront (1983).

assistance meetings at the state or regional level and consultant services were seen as potentially most helpful.

These data from NCES and Cheuvront suggest that Chapter 1 project directors would probably welcome special assistance in the use of computers. In general, Chapter 1 project directors, according to the NCES data, probably do not perceive needs in this area any more acutely than do other instructional directors at the local level.

Implications for Federal Responsibilities

Current evidence suggests that growing numbers of local Chapter 1 projects are acquiring and using computers in the provision of compensatory instruction. Because of these efforts by local Chapter 1 projects, Chapter 1 students have roughly equal opportunities for use of computers in school as do other students. Although Chapter 1 students are more likely to use the computers for drill and practice activities, the available evidence does not permit us to conclude that these assignments are unfair or improper.

At the local level, the most perplexing problems probably concern the decisions that are made regarding integration of computer-based instruction into the larger curriculum. From earlier studies and from anecdotal reports it seems clear that the introduction of computers into Chapter 1 projects--or into the regular instructional program--will not itself improve the learning of Chapter 1 participants. Improvement will be realized only to the extent that these technological tools advance the particular instructional objectives of the Chapter 1 project. Achieving these improvements requires careful local planning in the acquisition and use of both hardware and software.

The federal government can assist this planning in two ways. First, it can make certain that SEAs and local projects understand alternatives for complying with the Chapter 1 prohibition on general aid. This clarification would eliminate a hurdle that is reportedly impeding some projects from using Chapter 1 funds to acquire and use computers. Second, the federal government can provide opportunities for technical assistance in the planning and provision of computer-related instruction under Chapter 1. This help should focus on ways of integrating Chapter 1 instruction using computers into the

regular instructional program. It would necessarily entail suggestions to states and local districts on how to plan and coordinate computer-related instruction in districts' overall elementary and secondary curriculum as well as in Chapter 1 projects alone.

REFERENCES

Becker, H. J. "School uses of microcomputers: Reports from a national survey." Issue No. 1. Baltimore, Md.: Johns Hopkins University, Center for Social Organization of Schools, April 1983a.

Becker, H. J. "School uses of microcomputers: Reports from a national survey." Issue No. 2. Baltimore, Md.: Johns Hopkins University, Center for Social Organization of Schools, June 1983b.

Bloom, B. S. "Time and learning." American Psychologist. Volume 29, pp. 682-688, 1974.

Cheuvront, R. F. "Information on the use of computers in Chapter 1." Denver, Colo.: Colorado Department of Education, January 1983.

Market Data Retrieval. "Identifying and getting your share of the school market for microcomputers." Westport, Conn.: author, no date.

National Center for Education Statistics. "Instructional use of computers in public schools." D. Wright, Contact. Washington, D.C.: U.S. Department of Education, September 1982.

Office of Technology Assessment. "Informational technology and its impact on American education." Washington, D.C.: U.S. Congress, November 1982.

Ragosta, M. "Computer-assisted instruction and compensatory education: A longitudinal analysis." Machine-Mediated Learning. Volume 1:1, pp. 97-127.

Sheingold, K., J. Kane, M. Endreweit, and K. Billings. "Study of issues related to implementation of computer technology in schools." New York, N.Y.: Bank Street College of Education, July 1981.